

Pneumoperitoneum 48 Days After Laparoscopic Hysterectomy

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ABSTRACT

Background and Objectives: Postoperative pneumoperitoneum following laparoscopic surgery is self-limited, typically resolving within days.

Methods: We analyzed the case of a 48-y-old woman who presented with acute abdominal pain 48 d after a total laparoscopic hysterectomy. Imaging studies revealed free air under the diaphragm suggesting a perforated viscus.

Results: An exploratory laparotomy was performed, but no perforations or organic traumas were found intraoperatively. To the best of our knowledge, this is the longest period of time reported for persistent pneumoperitoneum after laparoscopic surgery.

Conclusion: Absent clinical findings, introduction of atmospheric air into the abdominal cavity during the original laparoscopic surgery was the most likely cause and is supported by the literature. Pneumoperitoneum observed up to 48 d status post laparoscopic hysterectomy, in the absence of peritoneal signs, fever, leukocytosis, or hemodynamic instability, may be considered for expectant management and serial inspection for clinical change.

Key Words: Pneumoperitoneum, Laparoscopy, Hysterectomy, Persistent.

INTRODUCTION

Pneumoperitoneum with carbon dioxide gas is used to facilitate laparoscopic procedures. Postoperative pneumoperitoneum following laparoscopic surgery is self-limited, typically resolving within days. Herein, we present a case of persistent pneumoperitoneum 48 d after laparoscopic hysterectomy; additionally, we aim to review the current body of literature regarding postoperative pneumoperitoneum.

CASE REPORT

A 48-y-old gravida 5, para 4, woman with a history of menorrhagia and chronic pelvic pain secondary to uterine leiomyoma presented to Howard University Hospital in February 2010. Opting for definitive treatment of her symptoms, she underwent total laparoscopic hysterectomy with an estimated blood loss of 150 mL. Following an uncomplicated postoperative course, she was discharged home on postoperative day 1. At her 2-wk routine postoperative visit, she was treated for bacterial vaginosis. Six weeks postoperatively, the patient was without complaints and progressing well. Specifically, she denied sexual intercourse and both digital and speculum examinations revealed an intact vaginal cuff.

On postoperative day 48, the patient presented to the emergency department with a complaint of acute abdominal pain. The pain began the previous night and was described as a cramping, sharp pain in the epigastric area with no exacerbating or relieving factors. She also reported nausea and vaginal bleeding and denied recent sexual intercourse or vaginal trauma. Evaluation in the emergency department was significant for a pulse of 108 beats per minute and a white blood cell count of $13.8 \times 10^3/\mu\text{L}$. Chest and abdominal X-rays demonstrated free air under the diaphragm (**Figures 1 and 2**). Gynecologic examination revealed an intact vaginal cuff. No peritoneal fluid or vaginal cuff defect was visualized at baseline or with the Valsalva maneuver. With a presumptive diagnosis of perforated viscus, the patient underwent emergent exploratory laparotomy.

Intraoperative findings revealed an intact liver and stomach without evidence of trauma. The small bowel, includ-

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The authors have no financial interests to disclose and have not received any financial support in the preparation of this article.

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DOI: 10.4293/108680813X13794522666446

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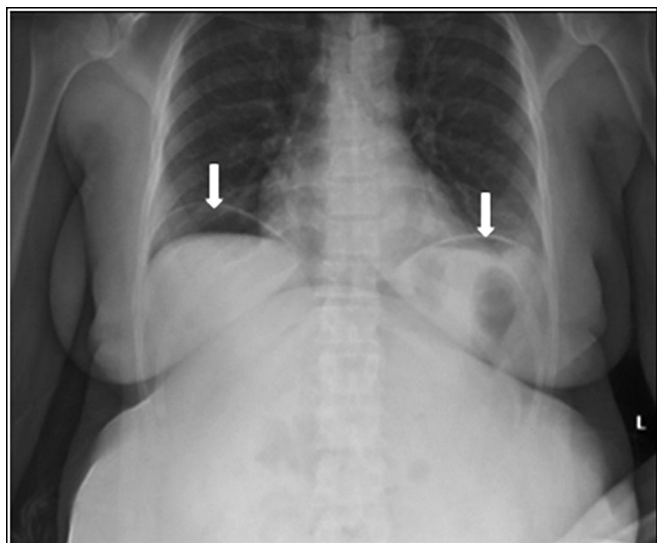


Figure 1. Anterior-posterior chest X-ray demonstrates pneumoperitoneum.

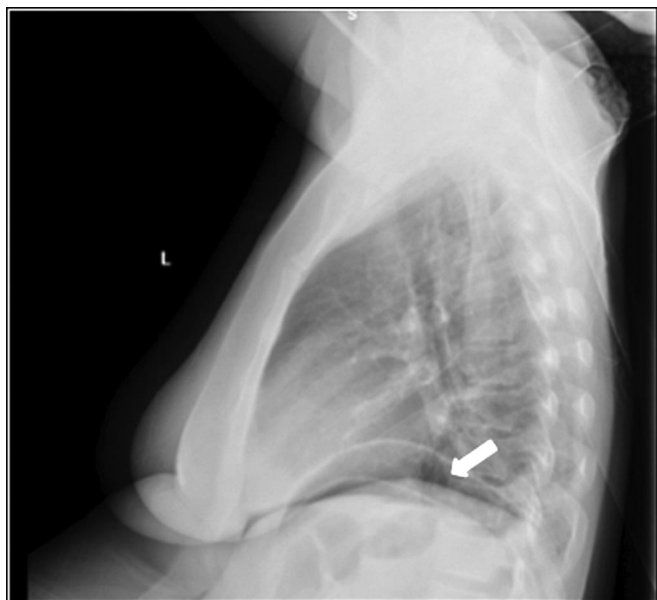


Figure 2. Lateral chest X-ray demonstrates pneumoperitoneum.

ing the appendix, and the large bowel were thoroughly inspected and no perforations or other abnormalities were noted. Inspection of the pelvis revealed inflammation at the intact vaginal cuff, which could explain the vaginal bleeding. However, no other abnormalities or defects were found and the operation was terminated. On postoperative day 1, the patient tolerated a liquid diet and pain was well controlled with medication. On postoperative day 2, the Foley catheter was removed and the patient was

voiding spontaneously. On postoperative days 3 to 4, the patient demonstrated return of bowel function with bowel movements. On postoperative day 5, the patient was discharged home in stable condition. At a 2-wk postoperative visit, the patient was asymptomatic; she denied any abdominal pain and reported that she was feeling well.

Applying the concept of *lex parsimoniae*, the postoperative diagnosis was retained pneumoperitoneum noting that all other surgical causes of pneumoperitoneum had been ruled out and other causes of nonsurgical pneumoperitoneum seemed unlikely.

DISCUSSION

Longer-duration pneumoperitoneum has previously been reported, and there are reports that support a phenomenon of delayed postoperative pneumoperitoneum in humans. Currently, the longest reported cases in the literature are 8 wk of retained pneumoperitoneum post laparotomy and 4 wk of retained pneumoperitoneum postlaparoscopy.¹⁻³

In the case presented, retained pneumoperitoneum postlaparoscopy was 48 d. No report to our knowledge has described a persistent pneumoperitoneum 48 d postoperatively, and our review of the literature supports atmospheric air in the abdominal cavity as the most likely cause. We hypothesize that the persistent postoperative pneumoperitoneum was caused by the influx of atmospheric air - versus carbon dioxide insufflation - into the abdominal cavity at the time of evacuation of surgical pneumoperitoneum released or during removal of the uterus vaginally. This hypothesis is supported by the research of Schier et al.⁴ Shier reported radiographic findings in piglets that had undergone laparoscopy utilizing carbon dioxide insufflation at time of closure, 1, 1.5, and 2 h after closure, and daily thereafter. Pneumoperitoneum achieved with carbon dioxide resolved within the first day.⁴ This is in contrast to duration of pneumoperitoneum as long as 25 d reported by Probst et al.⁵ after injection of air. Additionally, Gayer et al.⁶ ordered postoperative CT scans for 89 patients undergoing laparotomy for varied indications and found that, although pneumoperitoneum persisted for 44% of patients on postoperative day 3, another 30% revealed pneumoperitoneum between the fourth and 1eighth postoperative days.

Pneumoperitoneum is defined as free air in the peritoneal cavity and can be divided into 2 subgroups, surgical pneumoperitoneum (90%) and nonsurgical pneumoperitoneum (10%). Surgical pneumoperitoneum involves some

of the most common and most urgent causes of pneumoperitoneum including those attributed to a perforated viscus in the abdomen (i.e., perforated peptic ulcer, ruptured diverticulum, trauma, and other things); this group requires prompt diagnosis and intervention.^{7,8}

Nonsurgical pneumoperitoneum is usually defined as the presence of free air in the peritoneal cavity that is detectable by an X-ray or a CT scan and is either successfully treated nonoperatively or results in a negative exploratory laparotomy or laparoscopy. It is usually caused by physiologic processes that do not require surgical management, and based on its cause can be further divided into 5 categories, including postoperatively retained air, thoracic, abdominal, gynecologic, and idiopathic. Examples include retained postsurgical air, spontaneous bacterial peritonitis, blunt abdominal trauma, positive-pressure ventilation, gynecologic examination with or without insufflation, coitus, oro-genital sex, and vaginal douching. It is thought that retained postsurgical air is responsible for almost 25% of the cases of nonsurgical pneumoperitoneum.⁷

Postoperative pneumoperitoneum is a well-known sequela of abdominal surgery that is defined as the presence of free intraperitoneal air after surgery. In laparotomy, the origin of the air is thought to be room air, and in laparoscopy, the air is from carbon dioxide insufflation. Generally, postoperative pneumoperitoneum is believed to be bilateral and transient, demonstrating resolution within 7 d.⁸

More recent studies have corroborated that postoperative pneumoperitoneum resolves even earlier in the postoperative course. Nielsen et al.⁹ evaluated the duration of and factors contributing to persistent postoperative pneumoperitoneum. They followed 32 patients for 6 mo after abdominal surgery and concluded that postoperative pneumoperitoneum resolved within 2 d for most of the study population. They further noted that a high body mass index (BMI) and small initial amount of free air were associated with a shorter course of postoperative pneumoperitoneum.

Following laparoscopy, the duration of pneumoperitoneum is reported to be even shorter than that of patients who underwent laparotomy. In 2002, Stanley et al.¹⁰ studied 25 patients after gynecological laparoscopy to determine the duration of the pneumoperitoneum. They concluded that postoperative pneumoperitoneum is a self-limited process, and its effect on postoperative pain and amount of air present should be minimal by 48 h postoperation. Their findings are supported by the research of Draper et

al.¹¹ in which 30 of the 57 patients studied reached a resolution of their pneumoperitoneum within the first 24 h postoperation, 16 patients between 1 and 3 d, and 11 patients between 3 and 9 d; they demonstrated that most postoperative pneumoperitoneum resolves in just over 1 wk, with 96% of them resolving in 7 d.

Feingold et al.¹² studied the duration of postoperative pneumoperitoneum in 5 pigs following 4 laparoscopic and 1 open cholecystectomies. The pigs were evaluated using serial chest radiographs and CT scans of the abdomen. This study concluded that evidence of free air longer than postoperative day 2 after laparoscopy and day 6 after laparotomy is abnormal and should prompt investigation of other causes.

The duration of pneumoperitoneum in dogs relative to the amount of air introduced into to abdomen and maturity of the dogs was studied by Probst et al.⁵ Their study showed that the duration of the pneumoperitoneum is related to the amount of air introduced and the size (maturity) of the patient. From the results of their study, it is possible to infer that patients undergoing longer surgeries (i.e., more air introduced over time) or having a higher BMI should take more time to resolve their pneumoperitoneum.

The most common cause of pneumoperitoneum is free air in the abdominal cavity from laparotomy or laparoscopy. In patients who have not undergone surgery, pneumoperitoneum represents a perforated intraabdominal viscus 90% of the time, with gastric and duodenal ulcers comprising most these cases.¹³ In addition, 10% of cases of pneumoperitoneum are due to a variety of nonsurgical causes.

Inston et al.¹⁴ and Williams et al.¹⁵ describe instances of Jacuzzi-induced pneumoperitoneum without evidence of a perforated viscus. Johnson et al.¹⁶ reported a case of pneumoperitoneum after rough sexual intercourse and noted that a thorough gynecologic history is a valuable adjunct in making the diagnosis. In addition, Mularski et al.⁷ reviewed the nonsurgical causes of pneumoperitoneum using 482 articles extracted from the MEDLINE database and published between 1970 and 1999. They concluded that most of the instances of pneumoperitoneum occur as a procedural complication or as a complication of medical intervention. They asserted that clinicians should have a high index of suspicion for nonsurgical causes of pneumoperitoneum, as conservative management may be warranted in many cases.

In our review of our patient's history and her physical examination, none of the findings were consistent with

the most common causes of free intraperitoneal air. Our patient did admit to a medical history of hypertension and asthma; these being her only medical problems makes peptic ulcer disease, diverticular disease, and inflammatory bowel disease less likely. Furthermore, vaginal insufflation and trauma are also less likely causes of the free-intraperitoneal air, as our patient denied recent intercourse (vaginal or oral) or trauma. Physical examination and laboratory studies also revealed that she was afebrile with a normal white blood cell count, which makes an acute inflammatory process a less likely possibility. Lastly, the laparotomy performed allowed for thorough abdominal investigation, and its negative result subsequently supported the assertion of retained postoperative pneumoperitoneum and ruled out intraabdominal pathology.

In light of the patient's clinical presentation and the high index of suspicion for a perforated viscus, we assert that the decision to take the patient to the operating room for exploratory laparotomy was consistent with the standard of care in this clinical setting. Nonetheless, pneumoperitoneum observed up to 48 d status post laparoscopic hysterectomy, in the absence of peritoneal signs, fever, leukocytosis, or hemodynamic instability, may be considered for expectant management and serial inspection for clinical change.

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